CLAIMS

What we claim is:

1. An apparatus for detecting a stereo disparity between a scanning image and a reference image based on similarities measured by counting the number of pixels having lower differential brightness than a threshold in matched scanning windows, the matched scanning windows being respectively centered at a scanning pixel within a scanning range, the matched scanning window having the same size with a reference window centered at a reference pixel, the scanning range being defined by the constraint related to image-picturing conditions, and the differential brightness being obtained by comparing the brightness of each pixel in each scanning window to that of each pixel in the reference window, characterized by comprising:

a strip-processing unit for calculating in parallel the similarities of matched scanning columns in the scanning range with respect to a reference column centered at the reference pixel;

an S-buffer for storing the similarities calculated by said strip-processing unit;

a WMC-unit for calculating the window matching count (WMC) values of matched scanning windows in the scanning range with respect to the reference window using the similarities of the matched scanning columns stored in said S-buffer; and

a Max_WMC selection unit for selecting the greatest value among the WMC values calculated by said WMC-unit to generate a shift from the scanning pixel corresponding to the reference pixel to the center pixel of the matched scanning window associated with the greatest WMC value as a disparity mark of the stereo disparity.

2. The apparatus according to Claim 1, characterized by further comprising a WMC-updating unit for updating the WMC value of the current matched scanning window using the WMC value of the previous matched scanning window

calculated by said WMC-unit and the similarities of the matched scanning columns stored in said S-buffer.

3. The apparatus according to Claim 1 or 2, characterized in that said strip-processing unit comprises a plurality of S-units connected in parallel with each other, and brightness data of the matched scanning columns less than the number of said S-units can be inputted to a first S-unit and sequentially shifted to the next S-unit up to the last S-unit, and wherein said S-units calculate the similarity of each matched scanning column with respect to the reference column using differential brightness of pixels.

4. The apparatus according to Claim 3, characterized in that said first S-unit comprises:

a serial/parallel converter for converting serial brightness data of pixels on the matched scanning column into parallel data output to the next S-unit;

a differential-brightness processing unit for obtaining differential brightness of pixels between the matched scanning column and the reference column;

a comparator for comparing the differential brightness of pixels obtained by said differential-brightness processing unit to a threshold value;

an adder for accumulating outputs of pixels from said comparator; and

a D-flip-flop for buffering outputs from said adder into said S-buffer.

5. The apparatus according to Claim 3, characterized in that each of said S-units other than said first S-unit comprises:

a parallel/serial converter for converting parallel brightness data of pixels of the matched scanning column into serial data output to the next S-unit;

a differential-brightness processing unit for obtaining differential brightness of pixels between the matched scanning column and the reference column;

a comparator for comparing the differential brightness of pixels obtained by said differential-brightness processing unit to a threshold value;

an adder for accumulating outputs of pixels from said comparator; and

a D-flip-flop for buffering outputs from said adder into said S-buffer.

6. The apparatus according to Claim 2, characterized in that said S-buffer comprises:

(W_x+1) units of S-registers for sequentially shifting the (Sr+1) similarities inputted from said strip-processing unit;

W_x units of multiplexers for multiplexing outputs of said S-registers; and

a counter for counting the similarity data inputted to said S-register to output multiplexing control signals to said multiplexers, wherein W_x is the number of pixels in a horizontal row of the matched scanning window, and the value of Sr being obtained by subtracting the value of wx form the number of pixels in a horizontal row of the scanning range where $wx = \frac{W_x - 1}{2}$.

7. The apparatus according to Claim 6, characterized in that said WMC-unit comprises:

an adder for accumulating the similarities multiplexed by said multiplexers to output the WMC value.

8. The apparatus according to Claim 2, characterized in that said WMC-updating unit comprises:

a subtracter for subtracting the similarity of the foremost column of the previous matched scanning window from the WMC value of the previous matched scanning window; and

an adder for adding the similarity of the rearmost column of the current matched scanning window to the WMC value of the previous matched scanning window to obtain the WMC value of the current matched scanning window.

9. A method for detecting a stereo disparity between a scanning image and a reference image based on similarities measured by counting the number of pixels having lower differential brightness than a threshold in matched scanning windows, the matched scanning windows being respectively centered at a scanning pixel within a scanning range, the matched scanning window having the same size with a reference window centered at a reference pixel, the scanning range being defined by the constraint related to image-picturing conditions, and the differential brightness being obtained by comparing the brightness of each pixel in each scanning window to that of each pixel in the reference window, characterized by comprising the steps of:

processing in parallel the similarities of all matched scanning columns centered at the scanning pixels in the scanning range to a reference column centered at the reference pixel;

calculating the window matching count (WMC) values of all matched scanning windows with respect to the reference window using the similarities parallel processed in said column similarity processing step; and

selecting the greatest WMC and generating a shift from the scanning pixel corresponding to the reference pixel to the center pixel of the matched scanning window associated with the greatest WMC value as a disparity mark of the stereo disparity.

10. The method according to Claim 9, characterized in that said column similarity processing step comprises sub-steps of:

obtaining differential brightness between a reference pixel in the reference column and a scanning pixel matched to the reference pixel;

counting the number of pixels having differential brightness lower than a threshold in the matched scanning column; and

setting the number of pixels counted in said pixel counting sub-step as the similarity of the matched scanning column.

11. The method according to Claim 9, characterized in that said WMC value calculating step comprises a sub-step of calculating the WMC values between the matched scanning windows and a reference window including the foremost column in the reference image using the equation below:

$$WMC(x,y,d)=\sum_{i=-wy}^{wy}S(x+i,y,d)$$

wherein, wy represents $(W_y-1)/2$ and W_y represents the number of pixels in a column of the scanning window.

12. The method according to Claim 9, characterized in that said WMC value calculating step comprises a sub-step of calculating the WMC values between the matched scanning windows and another reference window not including the foremost column in the reference image using the equation below:

$$WMC(x,y,d)=WMC(x-1,y,d)+S(x+wx,y,d)-S(x-1-wx,y,d)$$

wherein, wy represents $(W_y-1)/2$ and W_y represents the number of pixels in a column of the scanning window.